

Simple Algebra

Part 3 • Algebra in Action

Now we'll see algebra in pictures:

$$y = x + 2$$

an equation with TWO mystery numbers!

1. Welcome to Part 3!

In Parts 1 and 2, every problem had ONE mystery number. In Part 3, we'll meet equations with TWO mystery numbers — and we'll learn to draw them as pictures!



What's New in Part 3

Equations with TWO variables (like $y = x + 2$)

Input/output tables

The coordinate plane (graph paper!)

Plotting points and drawing lines

Function machines

Inequalities (greater than, less than)

2. Two Variables Working Together

Look at this equation:

$$y = x + 2$$

This is different! There's no single answer. Instead, x and y work TOGETHER:

- If $x = 1$, then $y = 1 + 2 = 3$
- If $x = 5$, then $y = 5 + 2 = 7$
- If $x = 10$, then $y = 10 + 2 = 12$

The Idea

When x changes, y changes too — by following the rule.

x is the INPUT (whatever you pick).

y is the OUTPUT (what the rule gives back).

3. Making a Table

To see the pattern clearly, make a table. Pick some x values, then calculate y .

For the rule $y = x + 2$:

x (input)	$y = x + 2$	y (output)
0	$0 + 2$	2
1	$1 + 2$	3
2	$2 + 2$	4
3	$3 + 2$	5
4	$4 + 2$	6

See the pattern? Every time x goes up by 1, y also goes up by 1.

You Try

Make a table for $y = 2x$. Fill in the y values for $x = 0, 1, 2, 3, 4$.

Answers: $x = 0 \rightarrow y = 0$, $x = 1 \rightarrow y = 2$, $x = 2 \rightarrow y = 4$, $x = 3 \rightarrow y = 6$, $x = 4 \rightarrow y = 8$.

4. The Coordinate Plane

The coordinate plane is a special grid for drawing math. It has two lines (called AXES) that meet at zero:

- The **x-axis** goes LEFT and RIGHT.
- The **y-axis** goes UP and DOWN.

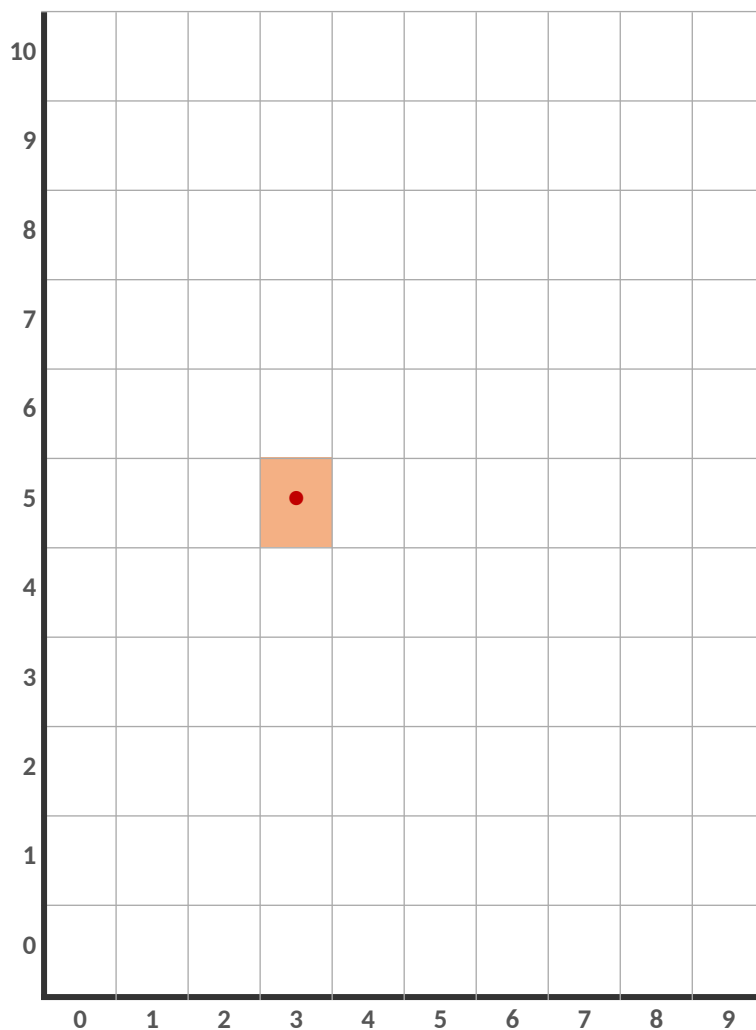
To plot a point, you give two numbers in parentheses: (x, y). The first number is how far RIGHT. The second is how far UP.

 **Example: the point (3, 5)**

(3, 5) means: start at zero, go 3 units RIGHT, then 5 units UP.

Picture an X marks the spot — (3, 5) is your X.

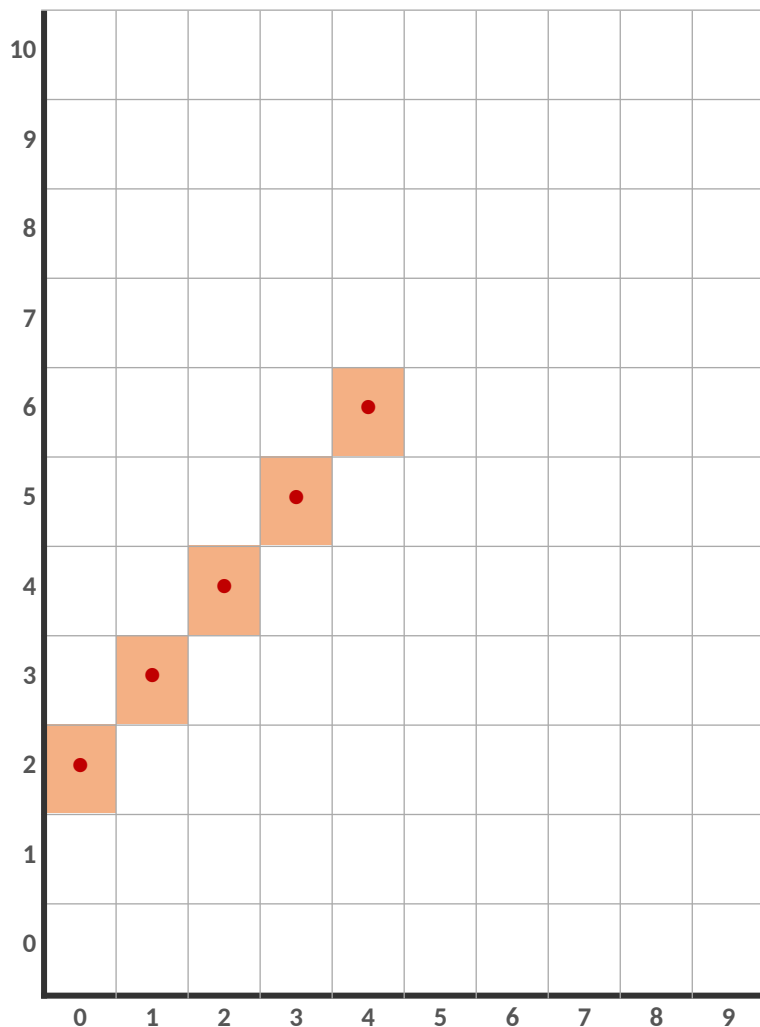
A coordinate plane with the point (3, 5) plotted:



5. Plotting an Equation

Remember our table for $y = x + 2$? Let's turn each row into a POINT and plot them all on the coordinate plane.

From the table, we get these points: (0, 2), (1, 3), (2, 4), (3, 5), (4, 6).



Notice This!

All the points line up in a straight line!

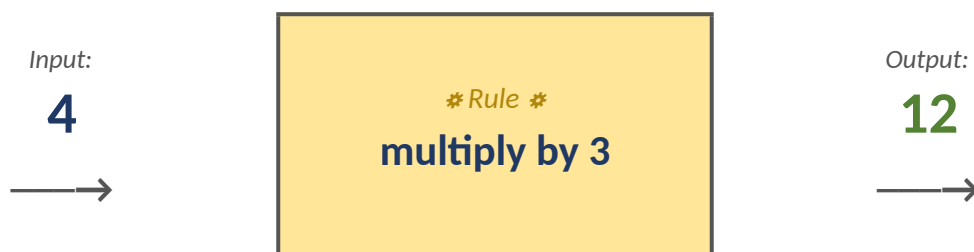
If you connect them with a ruler, you'd get a LINE. That's why $y = x + 2$ is called a LINEAR equation — it makes a line when you graph it.

6. Patterns Are Like Machines

Think of a rule like $y = x + 2$ as a MACHINE. You put a number in. The machine does something to it. A different number comes out.



This is called a FUNCTION. A function is a rule (or machine) that turns each input into exactly one output.



The Cool Part

Every equation with two variables (like $y = x + 2$ or $y = 3x$) is a function. You can think of it as a machine, OR as a table, OR as a graph — they're three views of the SAME thing.

7. Greater Than, Less Than (Inequalities)

Sometimes you don't need numbers to be EQUAL — you just need one to be bigger or smaller than the other. That's where INEQUALITIES come in.

Symbol	Means	Example
=	is equal to	$x = 5 \rightarrow x$ is exactly 5
>	is greater than	$x > 5 \rightarrow x$ is more than 5 (like 6, 7, 100)
<	is less than	$x < 5 \rightarrow x$ is less than 5 (like 4, 0, -10)
$\geq$	is greater than or equal to	$x \geq 5 \rightarrow x$ is 5 OR bigger
$\leq$	is less than or equal to	$x \leq 5 \rightarrow x$ is 5 OR smaller

Memory Trick

The wide-open end of $>$ and $<$ always points toward the BIGGER number.

5 > 3 (5 is bigger, so the wide side faces 5)

3 < 5 (5 is bigger, so the wide side faces 5)

8. Inequalities on a Number Line

An inequality like $x > 3$ doesn't have just one answer — it has LOTS of answers! Every number bigger than 3 works. We can show this on a number line.

$x > 3$ (x is strictly greater than 3 — but NOT 3 itself)



$x \geq 3$ (x is 3 OR bigger — including 3 itself)



$x < 5$ (x is less than 5 — but NOT 5 itself)



Open Circle vs Filled Circle

- **Open circle (o)** means "NOT included". Used for $>$ and $<$.
- **Filled circle (•)** means "included." Used for $\geq$ and $\leq$.

9. Solving Inequalities

Good news: solving an inequality works almost exactly like solving an equation! You use the same inverse operations and the Golden Rule.

$$x + 4 > 9$$

Subtract 4 from both sides — just like a regular equation:

$$x + 4 > 9$$



$$x + 4 - 4 > 9 - 4$$



$$x > 5$$

So x is any number greater than 5. Let's picture it:



One Tiny Warning (for later!)

There's a special rule: if you multiply or divide BOTH sides by a NEGATIVE number, you have to FLIP the inequality sign.

You won't run into this often as a 5th grader, but keep it in the back of your mind.

10. Algebra in the Real World

Look at how often algebra (with two variables) shows up in real life:



Allowance over time

If you save \$5 per week, then after w weeks you have $y = 5w$ dollars. Make a table! After 4 weeks: $y = \$20$.



Distance and time

If a car drives 60 mph, then after t hours it has gone $d = 60t$ miles. After 2 hours: $d = 120$ miles.



Phone bill

\$15 a month plus \$0.05 per text. Total cost: $c = 15 + 0.05t$. If you send 100 texts: $c = \$20$.



Cooking

If 1 cup of rice feeds 2 people, then to feed p people you need $r = p/2$ cups of rice. For 8 people: $r = 4$ cups.

11. Try It Yourself!

Try this!

Question 1: Make a table for the rule $y = 3x$

If $x = 0$, $y =$ ____ If $x = 1$, $y =$ ____ If $x = 2$, $y =$ ____ If $x = 4$, $y =$ ____

Try this!

Question 2: Plot the point (4, 7). Describe how you'd get there from zero.

My description: _____

Try this!

Question 3: Function machine! If the rule is **output = input $\times$ 5**:

Input 3 $\rightarrow$ output ____ Input 7 $\rightarrow$ output ____ Input 10 $\rightarrow$ output ____

Try this!

Question 4: Write the inequality symbol that goes in the blank:

7 ____ 10 15 ____ 9 8 ____ 8 (3 choices)

Try this!

Question 5: Solve the inequality: $x - 3 \geq 5$

x ____

Answers

1) $y = 0, 3, 6, 12$ 2) Go 4 right, then 7 up 3) 15, 35, 50 4) $7 < 10$, $15 > 9$, $8 = 8$ 5) $x \geq 8$

Congratulations — that's the whole guide!

You now know more algebra than most 5th graders. Keep practicing — and have fun finding patterns!